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Reliability of blood biomarkers of physiological stress at rest and in response to exercise under hot-humid conditions.

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Purpose: Establish the short-term reliability and acute responsiveness of biomarkers of physiological stress to exercise in the heat. As such, informing their prospective application in research and field settings. **Method:** Fourteen male endurance trained cyclists/triathletes completed two heat stress tests (HST), separated by 5-7 days. HST's involved 45-minutes fixed-intensity cycling (2.5W.kg^{-1}) under hot-humid conditions (32^{o}C and 70% relative humidity). Venous blood was drawn pre- and immediately post-HST for the concentration of normetanephrine (NMET), metanephrine (MET), kidney-injury molecule 1 (KIM-1), neutrophil gelatinase-associated lipocalin (NGAL), serum osmolality (S_{osmo}) and copeptin. **Results:** No biomarker displayed systematic trial order bias ($p \leq 0.05$). The majority of biomarkers had acceptable within-participant variation (CV range: 0.9-14.3%). Copeptin had the lowest short-term variation at rest (CV = 0.9%) and post-HST (CV = 1.2%). However, greater variation was evident in biomarkers MET and KIM-1 at rest (CV = 28.6 & 43.2%) and post-HST (CV = 29.9 & 29.6%), respectively. NMET exhibited *very large* increases (trial 1 = Δ1048 ± 461; trial 2 = Δ 1067 ± 408) in response to exertional heat stress (p <0.0001, d = 2.8; p <0.0001, d = 3.8). In contrast, KIM-1 demonstrated *trivial* changes (trial 1 = Δ -3 ± 21; trial 2 = Δ 2 ± 17) in response to exercise in the heat (p = 0.53, d = 0.1; p = 0.60, d = 0.1). **Conclusion:** Each biomarker, except MET and KIM-1 had acceptable reliability at rest and following exercise. In addition, biomarkers NMET, copeptin and NGAL demonstrated large increases in response to exercise in the heat. Thus, these markers can provide accurate and sensitive measurement for wide-spread application in laboratory and field research.